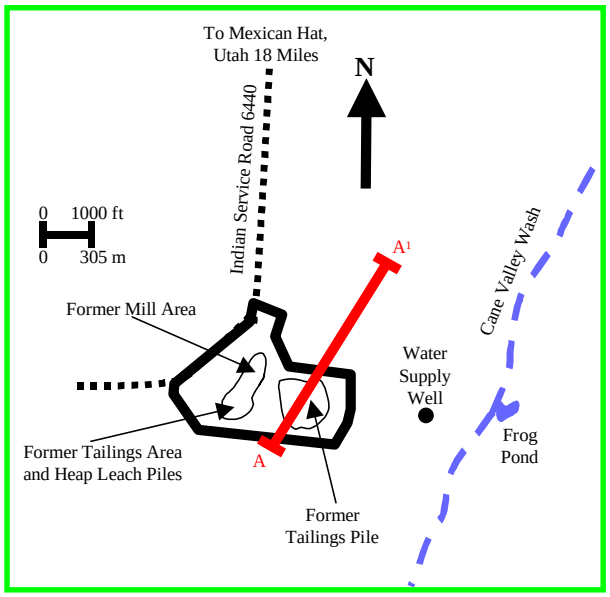
Vadose Zone Fact Sheet
Monument Valley

Background: The Monument Valley site is on Navajo Nation land, 27 km (17 mi) south of the Mexican Hat site and 8 km (5 mi) south of the Utah-Arizona border. The 37-hectare (90-acre) site consisted of two tailing piles, debris piles, and windblown-contaminated soil. The mission of the Monument Valley, Arizona mill site was to provide uranium for the United States national defense program.

Issues: The site is located on culturally sensitive tribal lands and within 450 m (1,500 ft) of residences.



Vadose zone infiltration: The shallow alluvial aquifer is recharged by occasional infiltration from flows in the Cane Valley Wash and to a minor extent from precipitation.

Vadose zone characterization/remediation: Surface remedial action was completed in 1994 and the source of contamination has been stabilized. The remedial action involved relocating approximately 703,152 m^3 (925,200 yd^3) of residual radioactive material from the existing site to the disposal cell at the Mexican Hat site in Halchita, Utah.

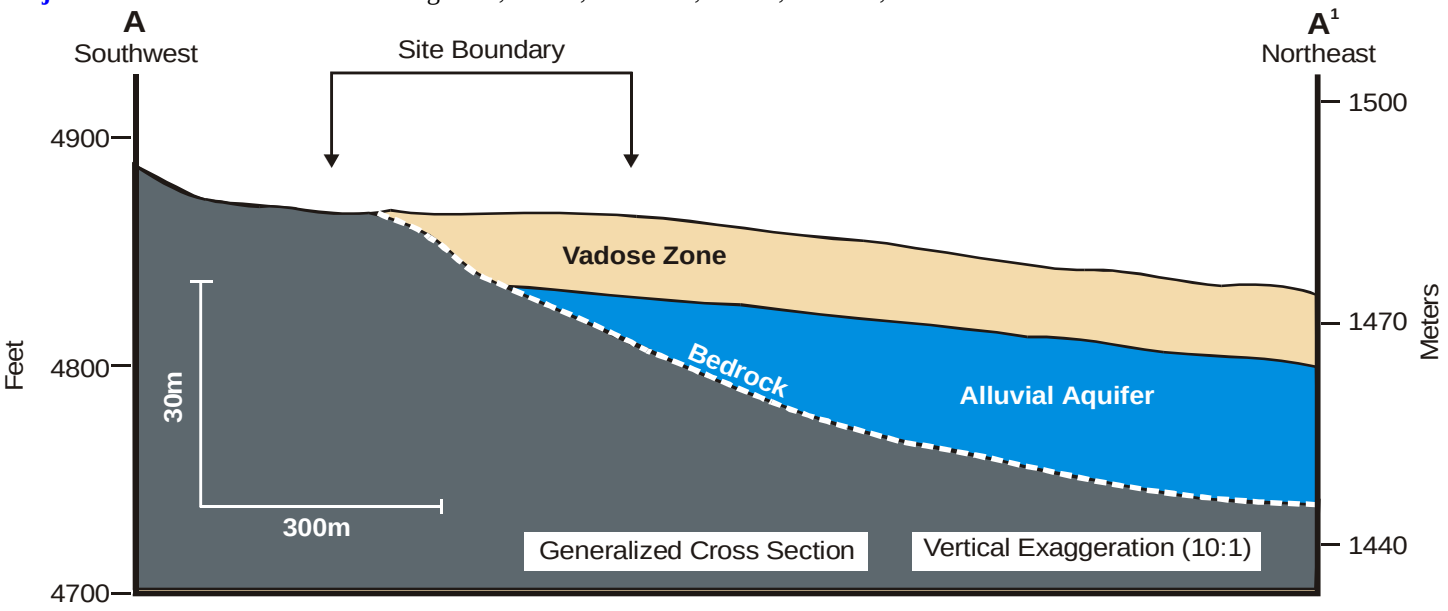
Precipitation: The climate is arid, with an average annual precipitation of 15 cm (6 in).

Surface Waters: Surface water features in the Monument Valley area consist of the Cane Valley Wash and several small ephemeral drainages that flow northeast into the Cane Valley Wash. A series of spring-fed wetlands and ponds occur northeast of the tailings site area. The Frog Pond is the surface water body closest to the site (600 m [2000 ft] to the east); this pond is routinely sampled and has not been contaminated.

Geology: The country in the vicinity of the site can generally be described as arid desert with hills, steep ridges, and mesas. Bedrock outcrops to the west of the site and along the western portion of the site. Unconsolidated dune sands overlie bedrock to the east of the site and along the eastern portion of the site. The dune sands at the eastern edge of the site are 6 to 9 m (20 to 30 ft) thick. The site elevation is approximately 1494 m (4900 ft).

Vadose zone thickness: The vadose zone thickness ranges from less than a meter in the Cane Valley Wash to more than 5 m (15 ft) under the site.

Major contaminants of concern: Manganese, nitrate, strontium, sulfate, uranium, and vanadium.

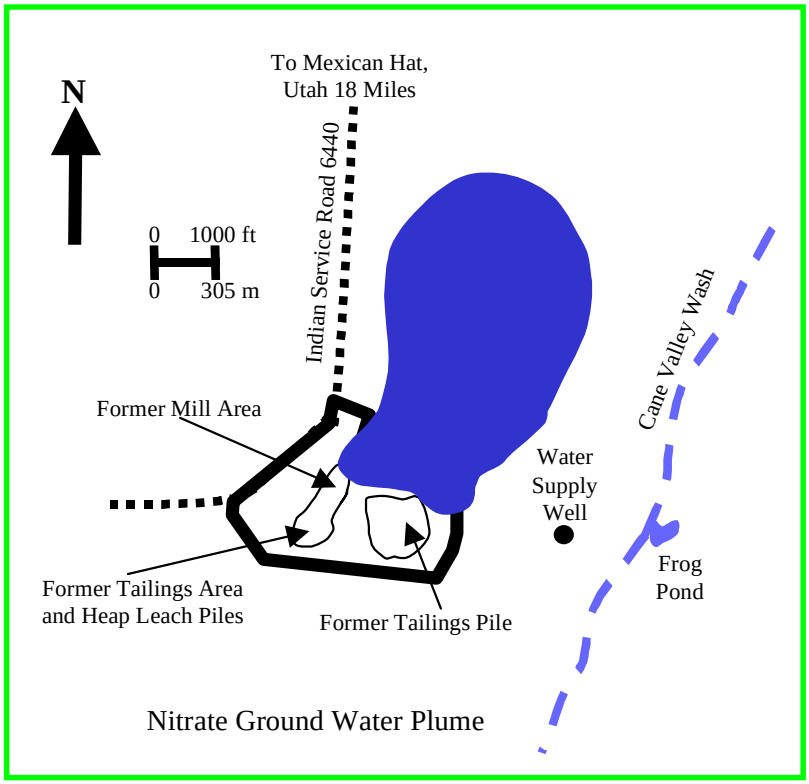


September 2000

Ground Water Fact Sheet
Monument Valley

Background: The Monument Valley site is on Navajo Nation land, 27 km (17 mi) south of the Mexican Hat site and 8 km (5 mi) south of the Utah-Arizona border. The 37-hectare (90-acre) site consisted of two tailing piles, debris piles, and windblown-contaminated soil. The mission of the Monument Valley, Arizona mill site was to provide uranium for the United States national defense program.

Hydrogeology: Ground water occurs in the alluvium and dune sand underneath the Monument Valley site and in the underlying bedrock formations. Occasional infiltration from precipitation and upward leakage from the underlying aquifers recharge the ground water in the alluvium. The alluvial aquifer flow is to the north at an estimated velocity range of 27 to 61 m (90 to 200 ft) per year. Below the alluvial aquifer, ground water occurs in conglomerate and confined sandstone aquifers. Ground water flows north at an estimated rate of 2 to 30 m (6 to 100 ft) per year in the conglomerate aquifer and 46 m (150 ft) per year in the sandstone aquifer.



Nitrate Ground Water Plume

Issues: The Monument Valley site is located on Navajo Nation land and will remain under the ownership of the Navajo Nation following Nuclear Regulatory Commission site certification. A Custodial Access Agreement between the Federal Government and the Navajo Nation will allow access to the site by the Department of Energy to carry out the UMTRA (Uranium Mill Tailing Remedial Action) Ground-Water Compliance Project. The affected Tribes will participate in any decisions made.

Ground water characterization/remediation: Residual milling-related contaminated ground water remains. Contamination in the ground water beneath the site has in the past exceeded the maximum concentration limits for net gross alpha, nitrate, radium-226 and -228, and uranium. A nitrate plume extends approximately 900 m (3000 ft) north of the site. Contaminated ground water has not affected domestic wells. The active remediation ground water compliance strategy involves extracting the contaminated ground water through pumping wells and applying the ground water via land application to make beneficial use of some ground water contaminants. The successful application of this technology must ensure the contaminated ground water does not create an additional contaminant pathway. Once the Nuclear Regulatory Commission determines that the site is in compliance with Subpart B of the Environmental Protection Agency Standards and the site is certified, no long-term surveillance or monitoring will be conducted.

Ground water use: Ground water in the plume is not currently being used. It is a potentially potable source and culturally sensitive, as it underlies tribal lands.

Primary Contaminants	Depth	Remedial Approach
Nitrate; sulfate	24 m (80 ft)	Phytoremediation; pump and treat; land application of ground water or reinjection of treated ground water; natural flushing